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FLOOD INSURANCE STUDY

CITY OF ST. CHARLES, ILLINOIS

KANE AND DU PAGE COUNTIES

MARCH 2, 1981

federal emergency management agency
federal insurance administration

COMMUNITY NUMBER - 170330

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Flood Boundary and Floodway Map

PUBLISHED SEPARATELY:

Flood Insurance Rate Map Index
Flood Insurance Rate Map

FLOOD INSURANCE STUDY

CITY OF ST. CHARLES
KANE AND DU PAGE COUNTIES, ILLINOIS

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study investigates the existence and severity of flood hazards in the City of St. Charles, Kane and Du Page Counties, Illinois, and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study will be used to convert the City of St. Charles to the regular program of flood insurance by the Federal Insurance Administration (FIA). Local and regional planners will use this study in their efforts to promote sound flood plain management.

In some states or communities, flood plain management criteria or regulations may exist that are more restrictive or comprehensive than those on which these Federally-supported studies are based. These criteria take precedence over the minimum Federal criteria for purposes of regulating development in the flood plain, as set forth in the Code of Federal Regulations at 44 CFR, 60.1 (d). In such cases, however, it shall be understood that the state (or other jurisdictional agency) shall be able to explain these requirements and criteria.

1.2 Authority and Acknowledgements

The source of authority for this Flood Insurance Study is the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

The hydrologic and hydraulic analyses for this study were performed by U.S. Army Corps of Engineers, Chicago District, for the Federal Insurance Administration, under Inter-Agency Agreement No. IAA-H-18-78, Project Order No. 13. This study was completed in March 1980.

1.3 Coordination

Streams requiring a detailed study were identified at a meeting attended by representatives of the U.S. Army Corps of Engineers (COE), the FIA, the State of Illinois, and the City of St. Charles, in December 1977.

A legal notice announcing, "Intent to Perform Flood Elevation Study" was published three times in the St. Charles Chronicle Press.

On October 14, 1980, the results of the work by the Study Contractor were reviewed and accepted at a final coordination meeting attended by representatives of the Study Contractor, the FIA, and community officials.

2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the incorporated area of the City of St. Charles, Kane and Du Page Counties, Illinois. The area of study is shown on the Vicinity Map (Figure 1).

The areas studied by detailed methods were selected with priority given to all known flood hazard areas, and areas of projected development or proposed construction through August 1985.

Approximate methods of analysis were used to study those areas having a low development potential or minimal flood hazards. The scope and methods of study were proposed to and agreed upon by the FIA and the City of St. Charles.

The areas studied by detailed methods are listed below:

a. Fox River, within the corporate limits;

b. Ferson Creek, within the corporate limits;

c. Seventh Avenue Creek from its confluence with the Fox River upstream to Tyler Road; and

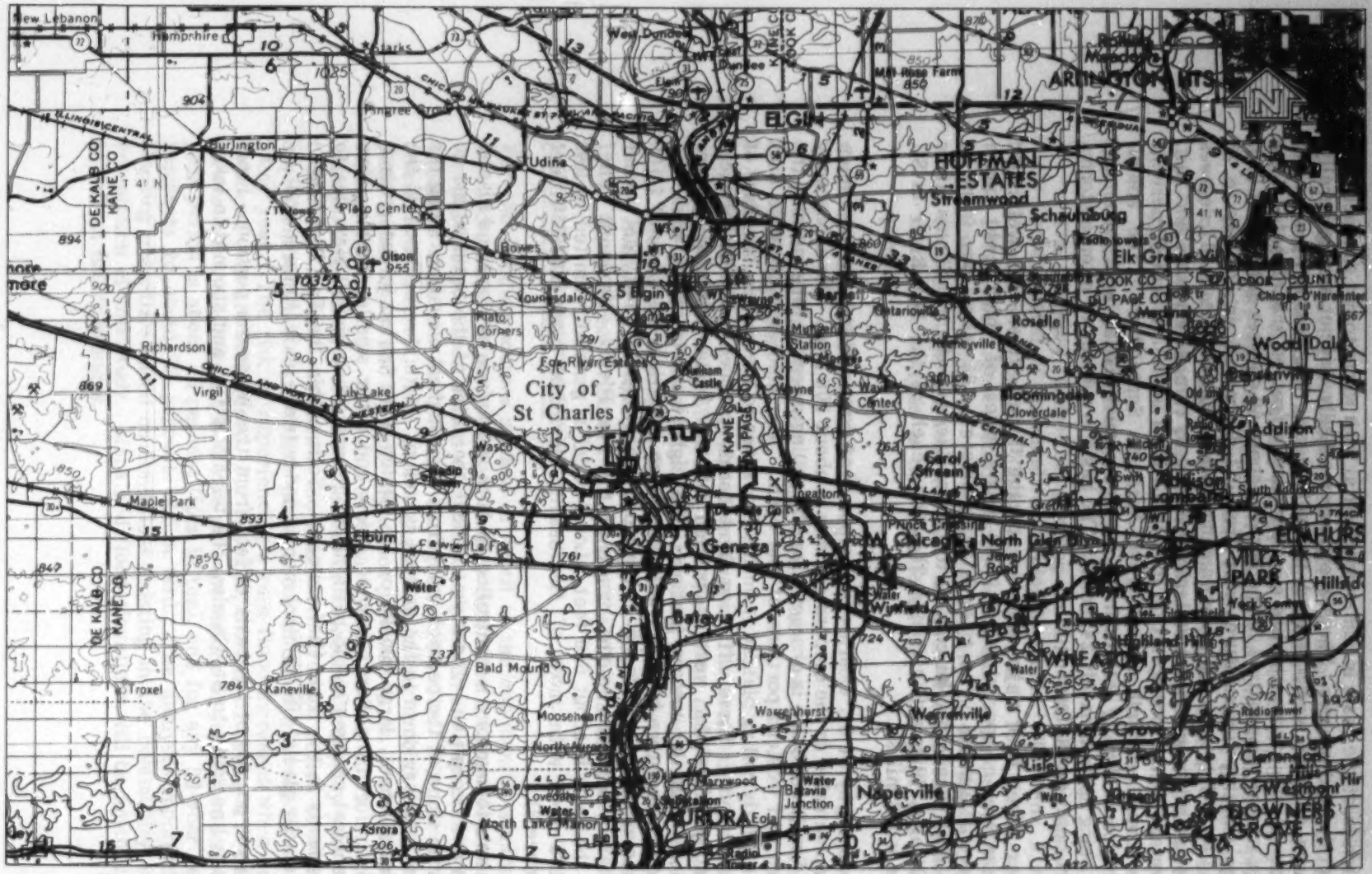
d. Seventh Avenue Creek Tributary, from its confluence with Seventh Avenue Creek upstream to the Chicago and North Western railroad tracks.

State Street Creek, from its confluence with the Fox River to the Chicago and North Western railroad tracks, and State Street Tributary from the mouth to 230 feet upstream of 15th Street, were studied by limited detail methods.

Flooding upstream of the Chicago and North Western railroad tracks on Seventh Avenue Creek Tributary was studied by approximate methods. In this area the floodwater depth is shallow and the floodwater velocity is insignificant; therefore, an approximate study already completed by the U.S. Geological Survey (USGS) was considered sufficient for inclusion in this study.

2.2 Community Description

The City of St. Charles is located in northeastern Illinois about 45 miles west of downtown Chicago. St. Charles is bordered on the south side by the City of Geneva, on the north and west sides by unincorporated Kane County and on the east by unincorporated Kane and Du Page Counties. The village is primarily a residential community. In 1970, the population of St. Charles was 20,352 and the total land area was 6.2 square miles (Reference 1).


City of
St Charles
ELGIN
AURORA
Batavia
Geneva
Elburn
Maple Park
Kaneville
Troxel
Virgil
Richardson
Lily Lake
Bald Mound
Moosehart
Aurora
Naperville
Wheaton
Glen Ellyn
Addison
Bloomingdale
Roselle
Schaumburg
Streamwood
Hoffman Estates
Arlington Hts
Elk Grove Vil
Wood Dale
Itasca
Bensenville
Elmhurst
Villa Park
Lombard
Oakbrook Terrace
Downers Grove
Westmont
Clarendon Hills
Hinsdale
Burr Ridge
Willowbrook
Darien
Woodridge
Lisle
Warrenville
Winfield
West Chicago
Carol Stream
Bartlett
Hanover Park
Poplar Creek
Elgin
South Elgin
St Charles
Geneva
Batavia

The climate of the basin is humid continental with warm to hot summers and moderately cold winters. The seasons are markedly distinct and, generally, lag three to five weeks behind the solstices. The proximity of Lake Michigan to the study area has a moderating effect on the climate. The average annual temperature in the basin is about 50 degrees Fahrenheit (F.). Average monthly temperatures vary from 20 degrees F. in January to 75 degrees F. in July with extremes ranging from -25 degrees F. to 112 degrees F. Precipitation within the watershed occurs as rain, sleet, snow and hail. The average annual precipitation for Illinois is 34 inches. About 60 percent of the annual rainfall occurs from April to September. The annual evaporation is slightly less than the average annual rainfall with the annual runoff being approximately 24 inches. The basin is subject to intense storms of short duration (Reference 2).

The Fox River is a major tributary of the Illinois River. Its watershed covers an area of approximately 2,580 square miles, of which 1,640 square miles are in Illinois. The river is approximately 185 miles long from its source near Waukesha, Wisconsin, to its confluence with the Illinois River near Ottawa, Illinois (Reference 2). The reach of the Fox River in St. Charles is 8.2 miles.

The topography of St. Charles is composed of gentle hills. The maximum topographic relief in the corporate limits is about 100 feet. The topography of the Fox River basin is characterized by rolling morainal hills marking the northern and western portions of the basin. The land east of these hills forms a gently rolling plateau from the Fox River to the eastern boundary of the watershed. These differing land forms produce an asymmetrical topography with the western portion of the basin attaining greater elevations than the eastern portion. The highest points in the basin are found on the western boundary with maximum elevations in excess of 1,100 feet above mean sea level. Minimum elevations of 440 feet occur immediately adjacent to the mouth of the Fox River. Maximum relief within the basin is about 660 feet. Local relief is generally limited to less than 100 feet with most of the basin's elevations near 700-750 feet (Reference 3).

The basin's topography is controlled by both subsurface geology and glacial erosion and deposition. The asymmetrical character of the basin is due to the gentle slope of the bedrock units from their highest elevations along the western boundary down to the eastern boundary. With the recession of the last glacial sheet, large blocks of ice, which were buried in the ground, melted to form the Fox Chain of Lakes and other smaller lakes. Few topographical changes in the basin have occurred since glacial time due to low gradients in the basin (Reference 3). Soils within the Fox River basin are primarily glacial till terminal morain and outwash plain (Reference 4).

The Illinois portion of the basin differs from the Wisconsin portion. From the state line south to St. Charles, the terrain is flat and abounds in lakes

and low-lying wetlands. The river falls about 70 feet in this 59-mile stretch and the abundant lakes and wetlands obscure the channel between low banks and wide flood plains. Within this 59-mile reach, but some distance from the river, topography gradually changes to gently undulating prairie and hilly areas with maximum elevations of the basin found at the western boundary of this stretch (Reference 3). The flood plain consists of about five percent commercial and 60 percent residential development. The remaining area is open space.

2.3 Principal Flood Problems

The primary cause of flooding in the Fox River basin is usually a combination of snowmelt and rainfall events. The Fox River frequently overflows its banks. Floods have occurred in 1954, 1960, 1962, 1973, and 1976. The largest recorded flood for the basin occurred in 1960. Discharges and frequencies are not available for any of the floods because the St. Charles Gage Station was not installed until 1962 (Reference 5), and statistical analysis is not undertaken until the gage has operated for 25 years.

2.4 Flood Protection Measures

Two dams affect the study area; these are the Geneva Dam and the St. Charles Dam.

Both dams are unregulated spillways. The crest elevation of the spillway and sluiceway is 675.3 feet for Geneva Dam and 684.3 feet for St. Charles Dam. Both these dams offer no flood protection; their sole purpose is to provide water storage for recreational uses. The culvert located on Seventh Avenue Creek contains the 500-year flood. The culvert located on State Street Creek Tributary will contain the 100-year flood.

3.0 ENGINEERING METHODS

For the flooding sources studied in detail in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Flood events of a magnitude which are expected to be equalled or exceeded once on the average during any 10-, 50-, 100-, or 500-year period (recurrence interval) have been selected as having special significance for flood plain management and for flood insurance premium rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10, 2, 1, and 0.2 percent chance, respectively, of being equalled or exceeded during any year. Although the recurrence interval represents the long term average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than one year are considered. For example, the risk of having a flood which equals or exceeds the 100-year flood (one percent chance of annual occurrence) in any 50-year period is about 40 percent (four in ten), and for any 90-year period, the risk increases to about 60 percent (six in ten). The analyses reported here reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak discharge-frequency relationships for floods of the selected recurrence intervals for each flooding source studied in detail affecting the community.

For the Fox River, peak discharge-frequency data were based on log-Pearson Type III (Reference 6) analysis of stage discharge records covering a 62-year period at the gaging station in Algonquin, Illinois (Reference 2). Unit hydrograph characteristics for the study area were based on other studies conducted by the COE for deriving regional unit hydrograph parameters for similar river basins in the northeastern portion of Illinois (References 7 and 8). Discharge hydrographs were calculated for selected flood events by utilizing precipitation data, runoff coefficients, base flows, and synthetic unit hydrographs. Rainfall data were generated by a statistical analysis of rain gage records. Four-hour increments of a 24-hour storm rainfall, corresponding to frequencies of 10-, 50-, and 100-years were obtained from U.S. Weather Bureau Technical Paper No. 40 (Reference 9). Rainfall values for the 500-year storm were then extrapolated from values for the lower three frequencies. Sets of these rainfall increments were entered into the HEC-1 model, in critical order, to obtain peak discharges for the 10-, 50-, 100-, and 500-year floods.

A HEC-1 hydrologic computer model was used to compute discharges (Reference 10). The HEC-1 model relates basin characteristics and rainfall data to stream discharge. The basin characteristics include vegetation, topography, amount and nature of development, and soil types. For the Fox River, the hydrologic model was calibrated with the 1973 flood event which was selected because it had a relatively uniform distribution over the river basin. For the calibration runs, the actual streamflow gaging values of Algonquin were used.

A comparison between discharge-frequency analysis at Algonquin Dam and the hydrologic model results was conducted to verify the outflow hydrograph. A log-Pearson Type III discharge-frequency analysis (Reference 6) was performed for the peak annual series at the Algonquin gaging station using the computer skew coefficients 0.62 and 0.0. The results of the HEC-1 model compare most favorably with the analysis which uses the 0.0 skew.

For Seventh Avenue Creek, Seventh Avenue Creek Tributary, and Ferson Creek, peak discharge-frequency determinations were based on analysis of basin characteristics and rainfall data using the HEC-1 hydrologic computer model (Reference 10). The basin characteristics include vegetation, topography, amount and nature of development, and soil types. As with the Fox River, unit hydrograph characteristics for the study area were based on

other studies (References 7 and 8), and discharge hydrographs were calculated for selected flood events by utilizing precipitation data, runoff coefficients, base flows, and synthetic unit hydrographs.

For State Street Creek and State Street Creek Tributary, peak discharge-frequency determinations were based on an analysis of basin characteristics using the State of Illinois Regression Equations (Reference 11). The basin characteristics include vegetation, topography, amount and nature of development, and soil types.

Peak discharges for the 10-, 50-, 100-, and 500-year floods of each flooding source studied in detail in the community are shown in Table 1.

TABLE 1 - SUMMARY OF DISCHARGES

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (SQ MILES)	PEAK DISCHARGE (CFS) 10-YEAR	50-YEAR	100-YEAR	500-YEAR
FERSON CREEK					
At mouth	54.5	1,959	3,486	4,020	6,430
FOX RIVER					
319,757 feet from mouth	1,649	7,535	11,225	12,250	16,875
SEVENTH AVENUE CREEK					
At mouth	2.85	158	258	303	429
6,864 feet from mouth	1.79	110	185	226	317
SEVENTH AVENUE CREEK TRIBUTARY					
At confluence	0.59	103	192	246	347
STATE STREET CREEK					
At mouth	0.66	123	N/A	226	N/A
STATE STREET CREEK TRIBUTARY					
At mouth	0.11	6	N/A	11	N/A

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of the streams in the community were carried out to provide estimates of the elevations of the floods of the selected recurrence intervals along each flooding source studied in detail.

Cross sections for the backwater analyses were determined from field surveys with some overbank cross sections being determined from topographic maps (Reference 12). Cross section locations were at close

intervals above and below bridges, dams, and culverts in order to compute the significant backwater effects of these structures.

Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles (Exhibit 1). For stream segments for which a floodway was computed (Section 4.2), selected cross section locations are also shown on the Flood Boundary and Floodway Map (Exhibit 2).

Roughness coefficients (Manning's "n" values) for the hydraulic computations were assigned on the basis of field inspection of flood plain areas. Roughness values varied for each stream studied in detail as shown in the following table. It should be noted that roughness values were increased during model calibration to reflect scour on Seventh Avenue Creek and Seventh Avenue Creek Tributary.

Flooding Source	Roughness Coefficients	
	Channel	Overbank
Ferson Creek	0.03 - 0.08	0.09 - 0.10
Fox River	0.40 - 0.07	0.07 - 0.10
Seventh Avenue Creek	0.025 - 0.10	0.05 - 0.08
Seventh Avenue Creek Tributary	0.05 - 0.06	0.08

Starting elevations for the 10-, 50-, 100-, and 500-year floods for the Fox River were based on the discharge recurrence interval rating curve at Geneva Dam and St. Charles Dam (Reference 13). The starting water-surface elevation for Ferson Creek, Seventh Avenue Creek, and Seventh Avenue Creek Tributary were determined using the normal depth subroutine of the COE HEC-2 computer model (Reference 14).

The water-surface elevations for floods of the selected recurrence intervals of the Fox River, Ferson Creek, Seventh Avenue Creek, and Seventh Avenue Creek Tributary were computed through use of the COE HEC-2 step-backwater computer program (Reference 14). This program relates stream geometry, characteristics, and discharge to stream elevation. Water-surface elevations for the floods of selected recurrence intervals of State Street Creek and State Street Creek Tributary were computed assuming normal depth at survey cross sections. Flood profiles were drawn showing computed water-surface elevations to an accuracy of 0.5 foot for floods of selected recurrence intervals (Exhibit 1). Flood elevations can often be increased by ice jams during spring thaws or by debris clogging bridges.

The hydraulic analyses for this study are based only on the effects of unobstructed flow. The flood elevations as shown on the profiles are, therefore, considered valid only if hydraulic structures, in general, remain unobstructed and if channel and overbank conditions remain essentially the same as ascertained during this study.

All elevations are referenced from National Geodetic Vertical Datum of 1929 (NGVD); elevation reference marks used in the study are shown on the maps.

4.0 FLOOD PLAIN MANAGEMENT APPLICATIONS

The National Flood Insurance Program encourages state and local governments to adopt sound flood plain management programs. Therefore, each Flood Insurance Study includes a flood boundary map designed to assist communities in developing sound flood plain management measures.

4.1 Flood Boundaries

In order to provide a national standard without regional discrimination, the 100-year flood has been adopted by the FIA as the base flood for purposes of flood plain management measures. The 500-year flood is employed to indicate additional areas of flood risk in the community. For each stream studied in detail, the boundaries of the 100-year and the 500-year floods have been delineated using the elevations determined at each cross section; between cross sections the boundaries were interpolated using topographic maps at scales of 1:4800 feet with contour intervals of four feet (Reference 12).

Flooding sources studied by approximate methods were eliminated from the maps because of a Federal Emergency Management Agency specification stating that a flood plain permanently narrowing to less than 100 feet in width would not be shown.

The boundaries of the 100- and 500-year floods are shown on the Flood Boundary and Floodway Map (Exhibit 2). Small areas within the flood boundaries may lie above the flood elevations and, therefore, not be subject to flooding; owing to lack of detailed topographical information or to limitations of the map scale, such areas are not shown. In cases where the 100-year and the 500-year flood boundaries are close together, only the 100-year boundary has been shown.

4.2 Floodways

Encroachment on flood plains, such as artificial fill, reduces the flood-carrying capacity, increases the flood heights of streams, and increases flood hazards in areas beyond the encroachment itself. One aspect of flood plain management involves balancing the economic gain from flood plain development against the resulting increase in flood hazard. For purposes of the National Flood Insurance Program, the concept of a floodway is used as a tool to assist local communities in this aspect of flood plain management. Under this concept, the area of the 100-year flood is divided into a floodway and a floodway fringe. The floodway is the channel of a stream plus any adjacent flood plain areas that must be kept free of encroachment in order that the 100-year flood may be carried without substantial increases in flood heights. Minimum standards of the FIA limit such increases in flood heights to 1.0 foot, provided that hazardous velocities are not produced. In Illinois, though, under Revised Statutes, Section 65f, Chapter 19 as amended 1973 (Reference 15) encroachment in the flood plain is limited to that which will cause only an insignificant increase in flood heights. Thus, at the recommendation of the Illinois Division of Water Resources, a floodway having no more than a 0.1-foot surcharge has been delineated for this study.

The floodway proposed for this study was computed on the basis of equal conveyance reduction from each side of the flood plain. The results of these computations were tabulated at selected cross sections of each stream studied (Table 2).

Portions of the floodway for the Fox River and Ferson Creek are beyond the corporate limits. No floodway was computed for State Street Creek and State Street Creek Tributary due to the limited detail nature of their study.

As shown on the Flood Boundary and Floodway Map (Exhibit 2), the floodway boundaries were determined at cross sections; between cross sections, the boundaries were interpolated. In cases where the boundaries of the floodway and the 100-year flood are either close together or collinear, only the floodway boundary has been shown.

The area between the floodway and the boundary of the 100-year flood is termed the floodway fringe. The floodway fringe thus encompasses the portion of the flood plain that could be completely obstructed without increasing the water-surface elevation of the 100-year flood more than 0.1 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to flood plain development are shown in Figure 2.

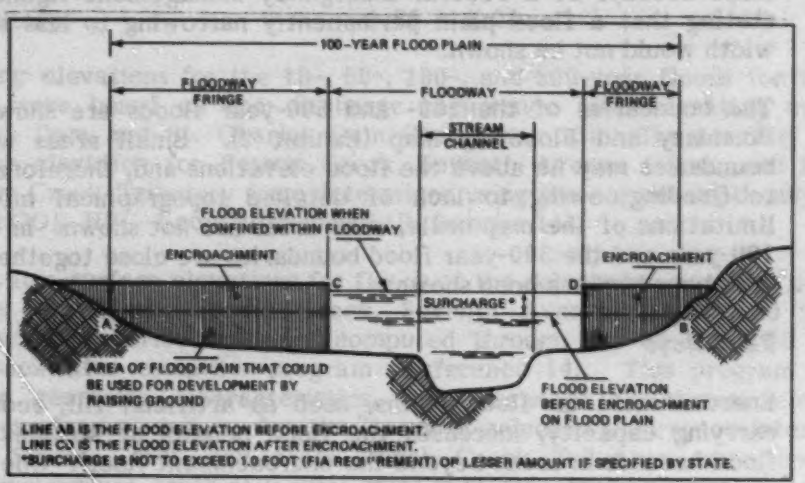

100-YEAR FLOOD PLAIN
FLOODWAY FRINGE
FLOODWAY
FLOODWAY FRINGE
STREAM CHANNEL
FLOOD ELEVATION WHEN CONFINED WITHIN FLOODWAY
ENCROACHMENT
ENCROACHMENT
C
D
SURCHARGE*
A
B
AREA OF FLOOD PLAIN THAT COULD BE USED FOR DEVELOPMENT BY RAISING GROUND
FLOOD ELEVATION BEFORE ENCROACHMENT ON FLOOD PLAIN
LINE AB IS THE FLOOD ELEVATION BEFORE ENCROACHMENT.
LINE CD IS THE FLOOD ELEVATION AFTER ENCROACHMENT.
*SURCHARGE IS NOT TO EXCEED 1.0 FOOT (FIA REQUIREMENT) OR LESSER AMOUNT IF SPECIFIED BY STATE.

FIGURE 2 - Floodway Schematic

The floodways in this report are recommended to local agencies as minimum standards that can be adopted or that can be used as a basis for additional studies.

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (NGVD)	WITHOUT FLOODWAY (NGVD)	WITH FLOODWAY (NGVD)	INCREASE (FEET)
FOX RIVER								
A	319,303	425	3656	3.4	686.4	686.4	686.5	0.1
B	320,248	370	1521	8.1	689.5	689.5	689.6	0.1
C	325,016	843/570[4]	5783	2.1	691.9	691.9	692.0	0.1
D	330,818	705/230[4]	8010	1.5	692.8	692.8	692.9	0.1
FERSON CREEK								
A	1357[2]	182/125[4]	1060	3.8	693.1	693.1	693.2	0.1
B	5296[2]	255	1376	2.9	703.5	703.5	703.6	0.1
7TH AVENUE CREEK								
A	623[2]	18	37	8.2	682.4	680.7[5]	680.7	0.0
B	2878[2]	31	94	2.9	704.5	704.5	704.6	0.1
C	5232[2]	28	132	1.9	711.9	711.9	711.9	0.0
D	6236[2]	27	85	3.0	717.4	717.4	717.4	0.0
E	7176[2]	30	131	1.7	720.8	720.8	720.9	0.1
F	7952[2]	28	67	3.4	721.9	721.9	722.0	0.1
G	9340[2]	36	141	1.8	728.0	728.0	728.1	0.1
7TH AVENUE CREEK TRIBUTARY								
A	63[3]	21	44	5.6	719.5	719.5	719.6	0.1
B	718[3]	57	145	1.7	726.0	726.0	726.1	0.1
C	1177[3]	15	82	3.0	730.7	730.7	730.8	0.1

[1]FEET ABOVE MOUTH
[2]FEET ABOVE CONFLUENCE WITH FOX RIVER
[3]FEET ABOVE CONFLUENCE WITH 7TH AVENUE CREEK
[4]TOTAL WIDTH / WIDTH WITHIN CORPORATE LIMITS
[5]ELEVATIONS WITHOUT CONSIDERING BACKWATER EFFECT FROM FOX RIVER

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

CITY OF ST. CHARLES, IL
(KANE AND DU PAGE COS.)

FLOODWAY DATA

FOX RIVER - FERSON CREEK - 7TH AVENUE CREEK - 7TH AVENUE CREEK TRIBUTARY

5.0 INSURANCE APPLICATION

In order to establish actuarial insurance rates, the FIA has developed a process to transform the data from the engineering study into flood insurance criteria. This process includes the determination of reaches, Flood Hazard Factors (FHF), and flood insurance zone designations for each flooding source affecting the City of St. Charles.

5.1 Reach Determinations

Reaches are defined as lengths of watercourses having relatively the same flood hazard, based on the average weighted difference in water-surface elevations between the 10- and 100-year floods. This difference does not have a variation greater than that indicated in the following table for more than 20 percent of the reach.

Average Difference Between 10- and 100-year Floods	Variation
Less than 2 feet	0.5 foot
2 to 7 feet	1.0 foot
7.1 to 12 feet	2.0 feet
More than 12 feet	3.0 feet

The locations of the reaches determined for the City of St. Charles are shown on the Flood Profiles (Exhibit 1) and are summarized in the Flood Insurance Zone Data Table (Table 3).

5.2 Flood Hazard Factors

The FHF is used to correlate flood information with insurance rate tables. Correlations between property damage from floods and their FHFs are used to set actuarial insurance premium rate tables based on FHFs from 005 to 200.

The FHF for a reach is the average weighted difference between the 10- and 100-year flood water-surface elevations expressed to the nearest 0.5 foot, and shown as a three-digit code. For example, if the difference between water-surface elevations of the 10- and 100-year floods is 0.7 foot, the FHF is 005; if the difference is 1.4 feet, the FHF is 015; if the difference is 5.0 feet, the FHF is 050. When the difference between the 10- and 100-year water-surface elevations is greater than 10.0 feet, accuracy for the FHF is to the nearest foot.

5.3 Flood Insurance Zones

After the determination of reaches and their respective FHFs, the entire incorporated area of the City of St. Charles was divided into zones, each

having a specific flood potential or hazard. Each zone was assigned one of the following flood insurance zone designations:

Zone A:	Special Flood Hazard Areas inundated by the 100-year flood, determined by approximate methods; no base flood elevations are shown or FHFs determined.
Zones A2-A5:	Special Flood Hazard Areas inundated by the 100-year flood, determined by detailed methods; base flood elevations are shown, and zones subdivided according to FHF.
Zone B:	Areas between the Special Flood Hazard Area and the limits of the 500-year flood, including areas of the 500-year flood plain that are protected from the 100-year flood by dike, levee, or other water control structure; or areas subject to certain types of 100-year shallow flooding where depths are less than 1.0 foot; and areas subject to 100-year flooding from sources with drainage areas less than 1 square mile. Zone B is not subdivided.
Zone C:	Areas of minimal flooding.

Table 3, "Flood Insurance Zone Data," summarizes the flood elevation differences, FHFs, flood insurance zones, and base flood elevations for each flooding source studied in detail in the community.

5.4 Flood Insurance Rate Map Description

The Flood Insurance Rate Map for the City of St. Charles is, for insurance purposes, the principal result of the Flood Insurance Study. This map (published separately) contains the official delineation of flood insurance zones and base flood elevation lines. Base flood elevation lines show the locations of the expected whole-foot water-surface elevations of the base (100-year) flood. This map is developed in accordance with the latest flood insurance map preparation guidelines published by the FIA.

6.0 OTHER STUDIES

A Flood Hazard Information Report was completed in January 1978 by Carl C. Crane, Inc., for the Chicago District COE (Reference 16). A Plan of Study report on the Fox River and its tributaries was completed in December 1977 by the Chicago District COE (Reference 17).

FLOODING SOURCE	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1.0% (100-YEAR) FLOOD AND			FLOOD HAZARD FACTOR	ZONE	BASE FLOOD ELEVATION[3] (NGVD)
		10% (10-YEAR)	2% (50-YEAR)	0.2% (500-YEAR)			
FOX RIVER							
REACH 1	0001,0004	–2.1	–0.4	1.4	020	A4	VARIES–SEE MAP
FERSON CREEK							
REACH 1	0001	–2.2	–0.5	1.8	020	A4	VARIES–SEE MAP
7TH AVENUE CREEK							
REACH 1	0004	–0.8	–0.2	0.3	010	A2	VARIES–SEE MAP
REACH 2	0004	–2.7	–0.9	2.0	025	A5	VARIES–SEE MAP
REACH 3	0004,0005	–1.8	–0.6	0.7	020	A4	VARIES–SEE MAP
7TH AVENUE CREEK TRIBUTARY							
REACH 1	0004	–1.5	–0.4	0.6	015	A3	VARIES–SEE MAP
STATE STREET CREEK							
REACH 1[4]	0004	–1.1	N/A	N/A	010	A2	VARIES–SEE MAP
STATE STREET CREEK TRIBUTARY							
REACH 1[4]	0004	–0.9	N/A	N/A	010	A2	VARIES–SEE MAP

[1]FLOOD INSURANCE RATE MAP PANEL
[2]WEIGHTED AVERAGE
[3]ROUNDED TO NEAREST FOOT
[4]50–, 500–YEAR FLOOD ELEVATIONS NOT COMPUTED

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

CITY OF ST. CHARLES, IL
(KANE AND DU PAGE COS.)

FLOOD INSURANCE ZONE DATA

FOX RIVER - FERSON CREEK - 7TH AVENUE CREEK - 7TH AVENUE CREEK TRIBUTARY - STATE STREET CREEK - STATE STREET CREEK TRIBUTARY

These reports along with the Southeastern Wisconsin Regional Planning Commission Report (Reference 2) were taken into consideration in the preparation of this report. At present, Flood Insurance Studies are being prepared for the Village of Valley View, the City of Geneva, the City of Elgin, and Kane County in Illinois (References 18, 19, 20 and 21). The results of these studies will match the findings of this report.

A Flood Hazard Boundary Map has been published by the Federal Insurance Administration (Reference 22). The differences between the Flood Hazard Boundary Map and this study are justified due to the more detailed nature of this Flood Insurance Study.

This report either supersedes or is compatible with all previous studies published on streams studied in this report and should be considered authoritative for the purposes of the National Flood Insurance Program.

7.0 LOCATION OF DATA

Survey, hydrologic, hydraulic and other pertinent data used in this study can be obtained by contacting the Insurance and Mitigation Division, Federal Emergency Management Agency, One North Dearborn Street, Chicago, Illinois 60602.

8.0 REFERENCES AND BIBLIOGRAPHY

1. U.S. Department of Commerce, Bureau of the Census, Census of Population, Number of Inhabitants, Illinois, Washington, D.C., 1971.

2. Southeastern Wisconsin Regional Planning Commission, Planning Report No. 12, Volume One and Two, A Comprehensive Plan for the Fox River Watershed, Waukesau, Wisconsin, April 1969.

3. North Central Chicago Engineering Division-Hydraulics, Memorandum for File, Fox River, Special Flood Hazard Study Chain of Lakes, McHenry and Lake Counties, Illinois, 1978.

4. U.S. Department of Agriculture, Soils Conservation Service, Soil Survey of Kane County, Illinois, April 1979.

5. U.S. Geological Survey, St. Charles Gage Station, No. 05551220, 1962 to present.

6. U.S. Water Resources Council, Hydrology Committee, Bulletin No. 17, Guidelines for Determining Flood Flow Frequency, Washington, D.C., March 1976.

7. Illinois Division of Water Resources, Guidelines for Operational Procedures at McHenry Dam, 1977.

8. U.S. Army Corps of Engineers, Hydrologic Engineering Center, Special Project Memo No. 412, Des Plaines River Basin, Duplicate Lock Hydrology Study, September 1973.

9. U.S. Department of Commerce, Weather Bureau, Technical Paper No. 40, Rainfall Frequency Atlas of the United States (for durations from 30 minutes to 24 hours and return periods from 1-100 years), U.S. Government Printing Office, Washington, D.C., May 1961.

10. U.S. Army Corps of Engineers, Hydrologic Engineering Center, HEC-1: Flood Hydrograph Package, Computer Program 823-X6-L2010, Davis, California, January 1973.

11. U.S. Geological Survey, Effects of Urbanization on the Magnitude and Frequency of Floods in Northeastern Illinois, 79-36, 1979.

12. U.S. Army Corps of Engineers, Chicago District, Topographic Maps, Scale 1:4800, Contour Interval four feet: Unincorporated Areas of Kane County, Illinois, September-October 1978.

13. ————————, Chicago District, A Plan of Study for the Fox River and its Tributaries, Chicago, Illinois, 1976.

14. ————————, Computer Program 723-X6-L202A HEC-2 Water-Surface Profiles, The Hydrologic Engineering Center, Davis, California, February 1972.

15. Illinois Department of Transportation, Division of Water Resources, Rules and Regulations, Regulation of Construction Within Flood Plains Established Pursuant to Section 65F, Chapter 19, Illinois Revised Statutes, Springfield, Illinois, 1973.

16. U.S. Army Corps of Engineers, Chicago District, Flood Hazard Information Report, Chain of Lake McHenry and Lake Counties, Illinois, January 1978.

17. ————————, Study Report on Fox River and Tributaries, Illinois and Wisconsin, December 1977.

18. Federal Emergency Management Agency, Flood Insurance Administration, Flood Insurance Study, Village of Valley View, Illinois, (in progress).

19. ————————, Flood Insurance Study, City of Geneva, Illinois, (in progress).

20. U.S. Department of Housing and Urban Development, Flood Insurance Administration, Flood Insurance Study, City of Elgin, Illinois, June 1978.

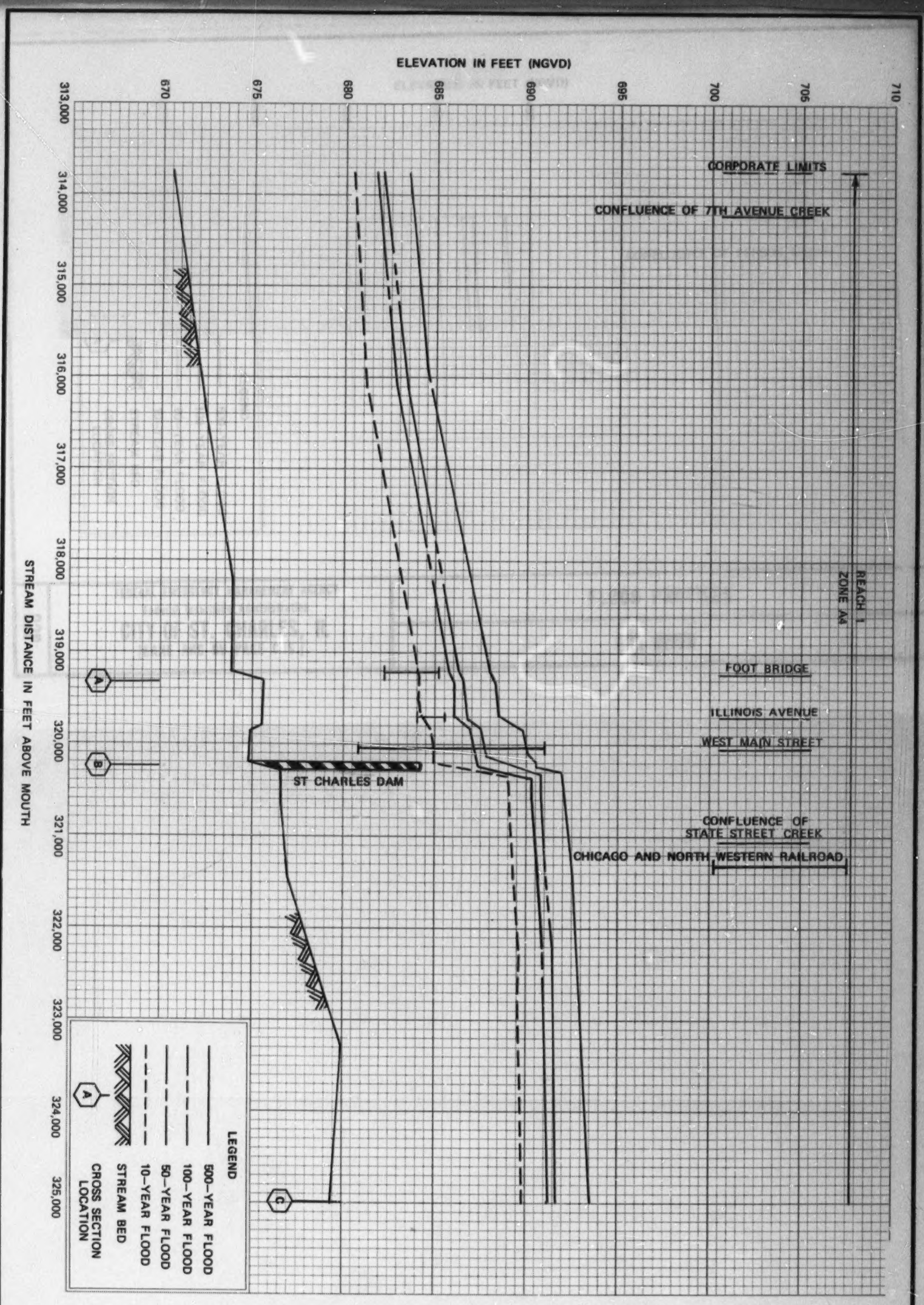
21. Federal Emergency Management Agency, Federal Insurance Administration, Flood Insurance Study, Unincorporated Areas of Kane County, Illinois, (in progress).

22. U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Hazard Boundary Map, City of St. Charles, Illinois, December 1976.

U.S. Army Corps of Engineers, Hydrologic Engineering Center, Flood Flow Frequency Analysis, Computer Program 723-X6-L7550, June 1976.

————————, Special Project Memo No. 415, Chicago Metropolitan Area Study, Du Page River Basin, October 1973.

U.S. Department of Agriculture, Soil Conservation Service, Technical Release No. 55, Urban Hydrology for Small Watershed, January 1975.



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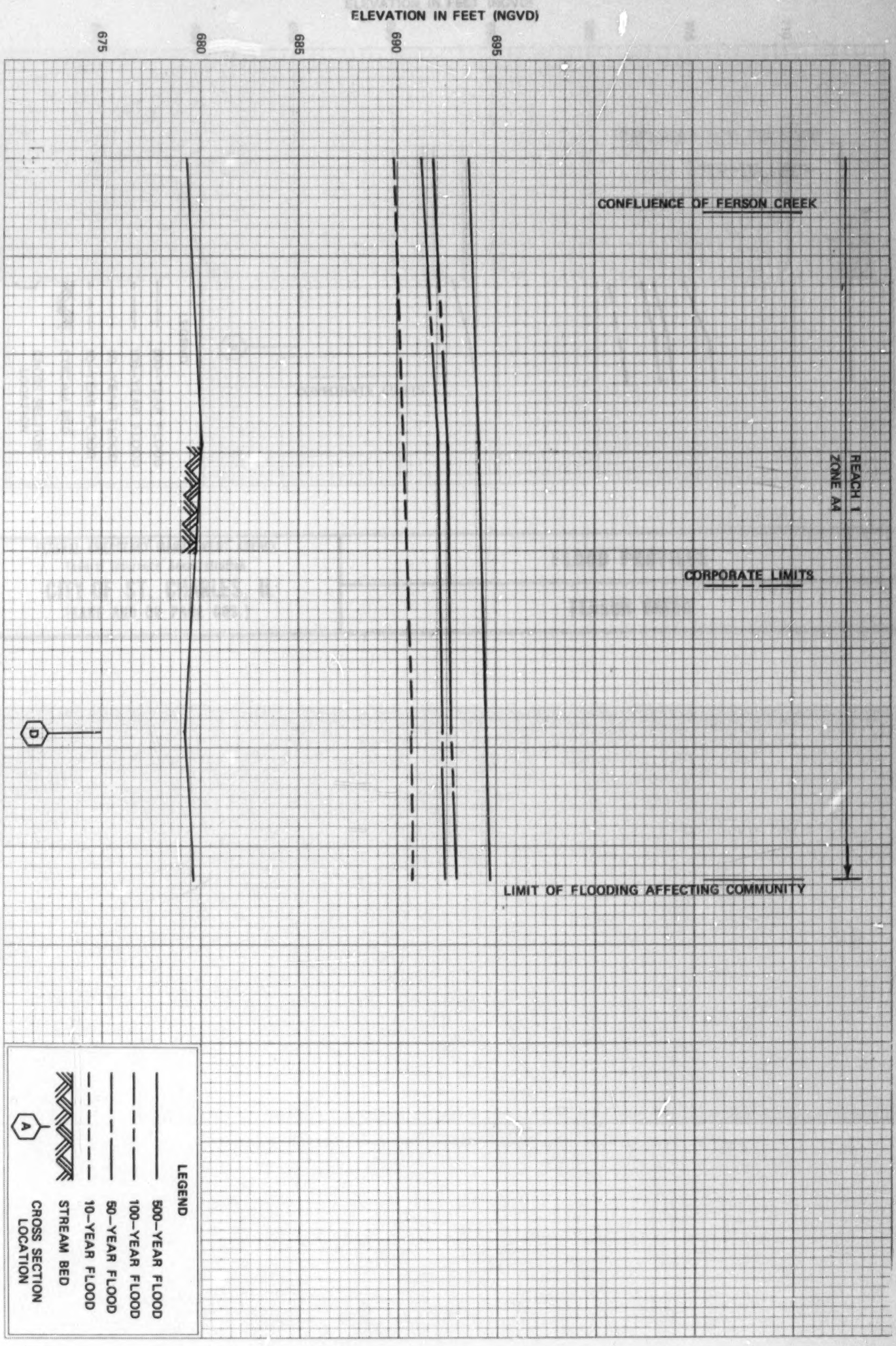
FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration
CITY OF ST. CHARLES, IL
(KANE AND DU PAGE COS.)

FLOOD PROFILES

FOX RIVER



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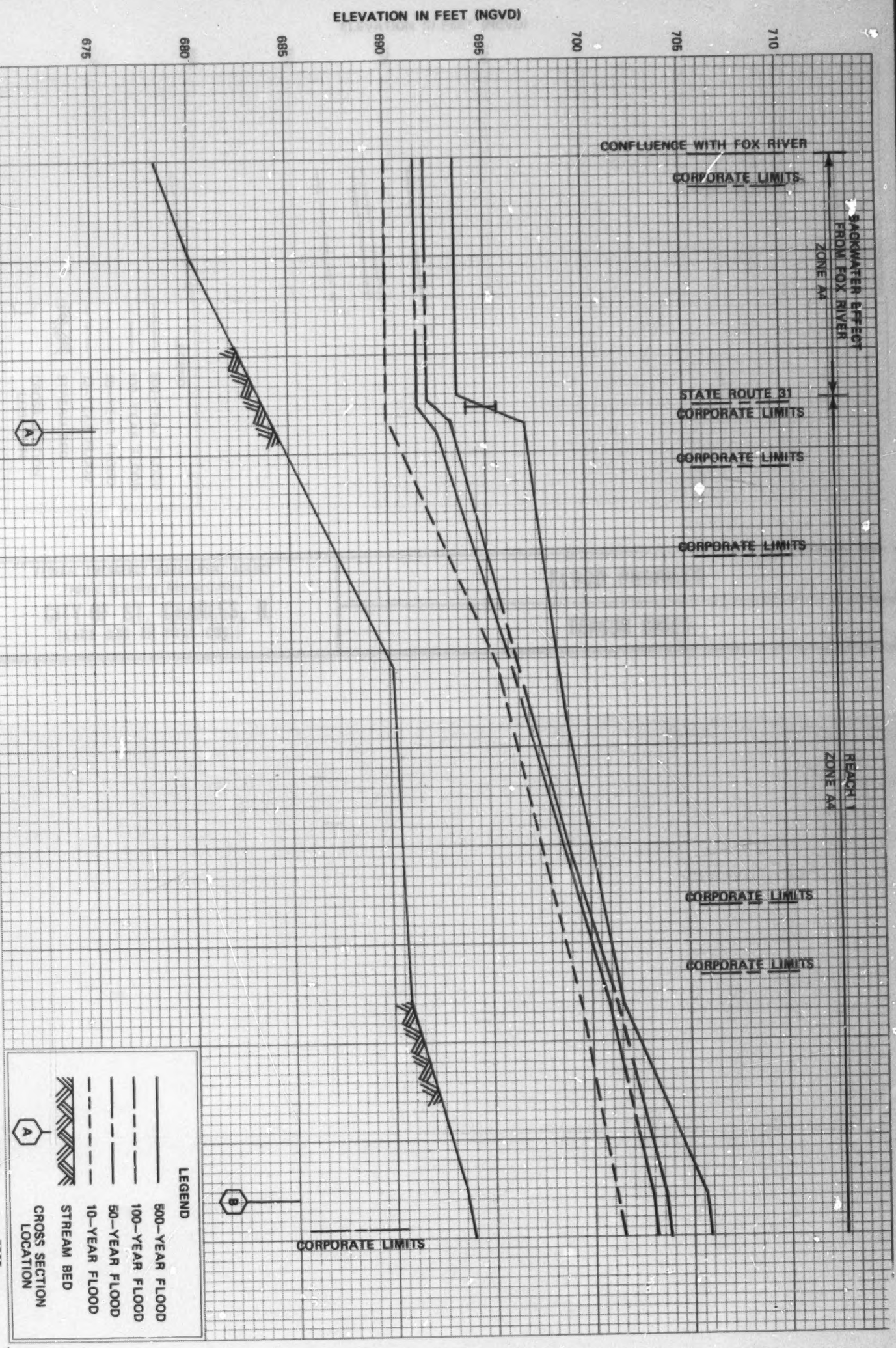
FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

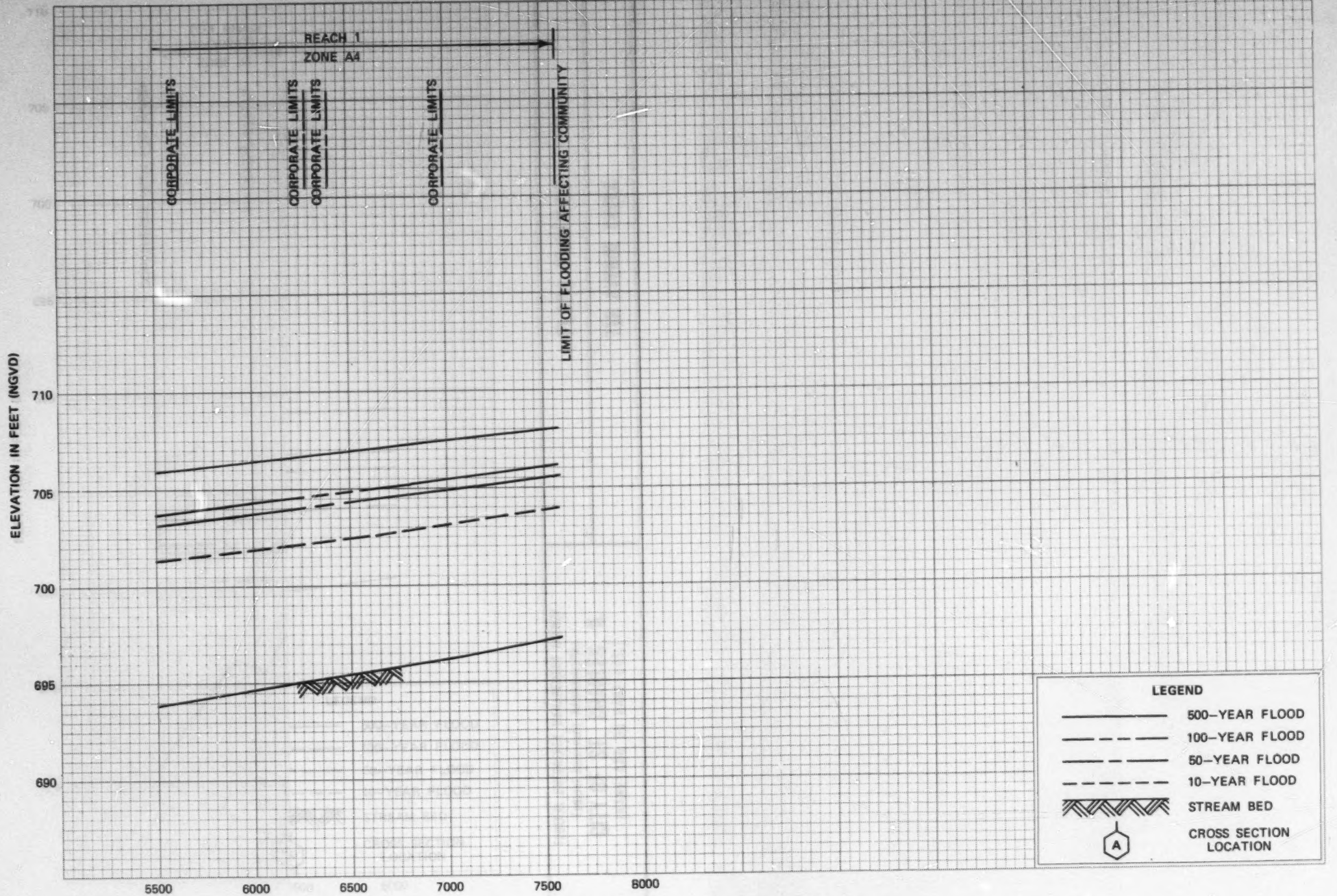
CITY OF ST. CHARLES, IL
(KANE AND DU PAGE COS.)

FLOOD PROFILES

FOX RIVER



03P	FEDERAL EMERGENCY MANAGEMENT AGENCY Federal Insurance Administration **CITY OF ST. CHARLES, IL** (KANE AND DU PAGE COS.)	**FLOOD PROFILES** **FERSON CREEK**



FLOOD PROFILES

FERSON CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

CITY OF ST. CHARLES, IL
(KANE AND DU PAGE COS.)

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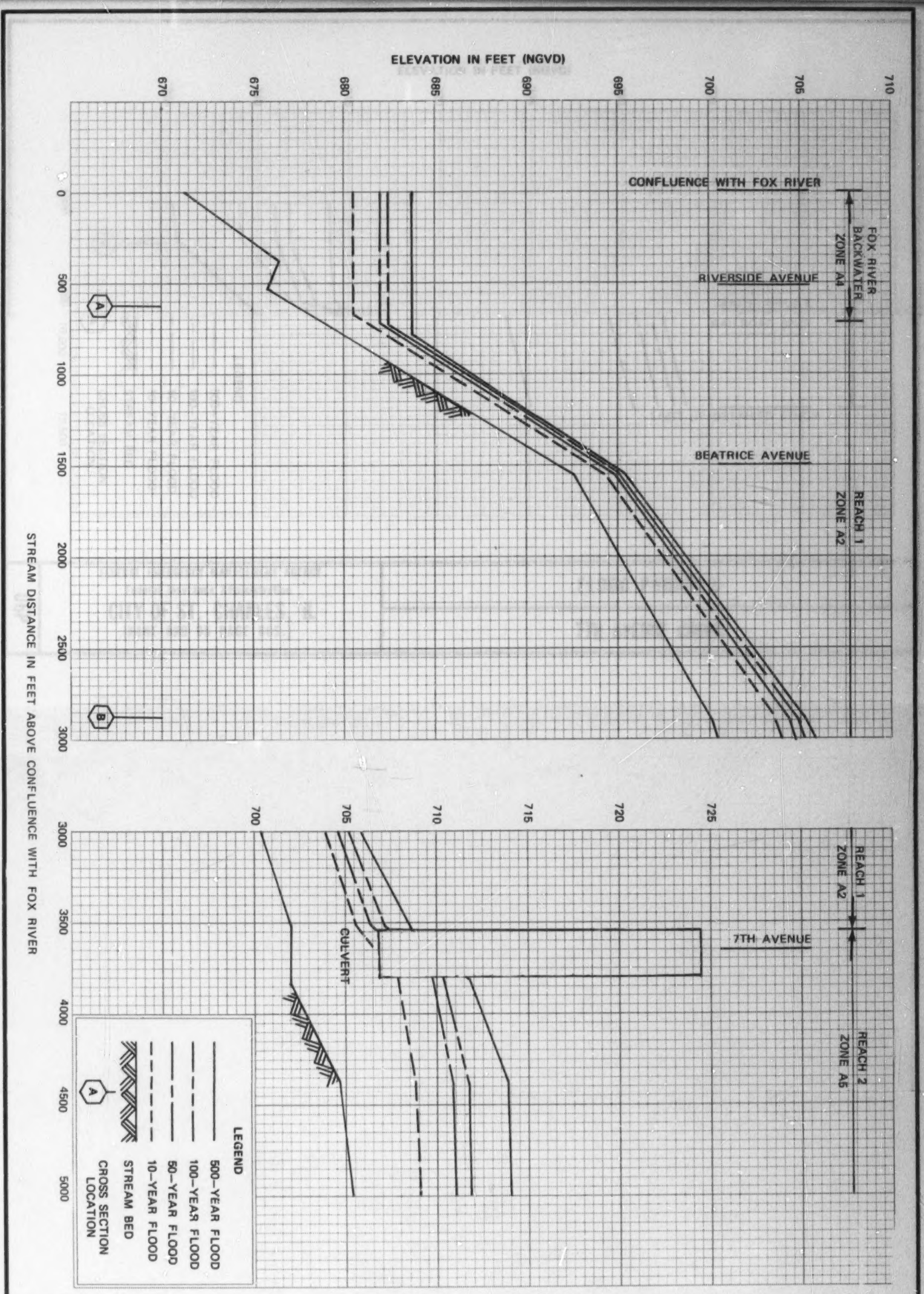

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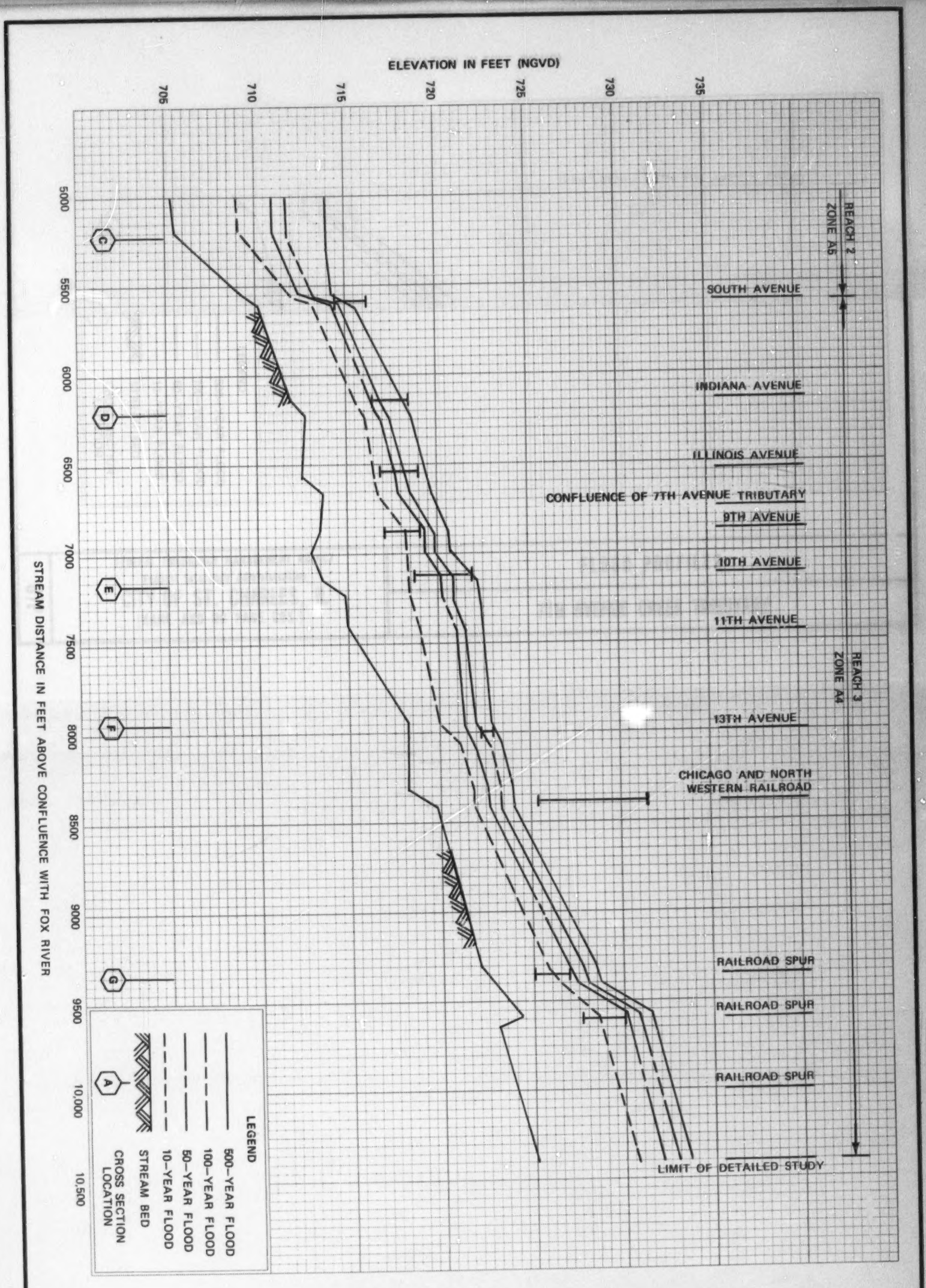
FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration
CITY OF ST. CHARLES, IL
(KANE AND DU PAGE COS.)

FLOOD PROFILES

7TH AVENUE CREEK



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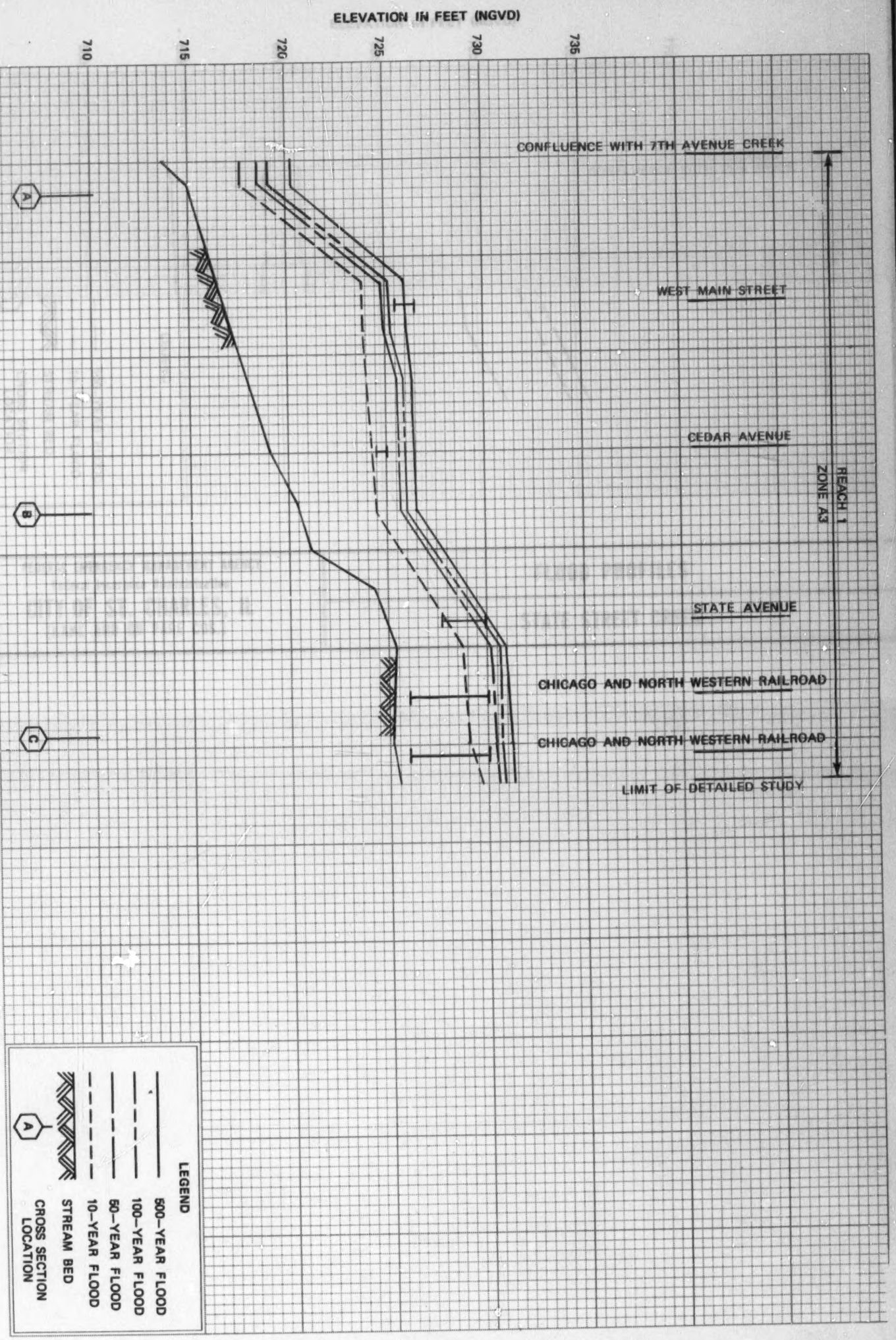
FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

CITY OF ST. CHARLES, IL
(KANE AND DU PAGE COS.)

FLOOD PROFILES

7TH AVENUE CREEK



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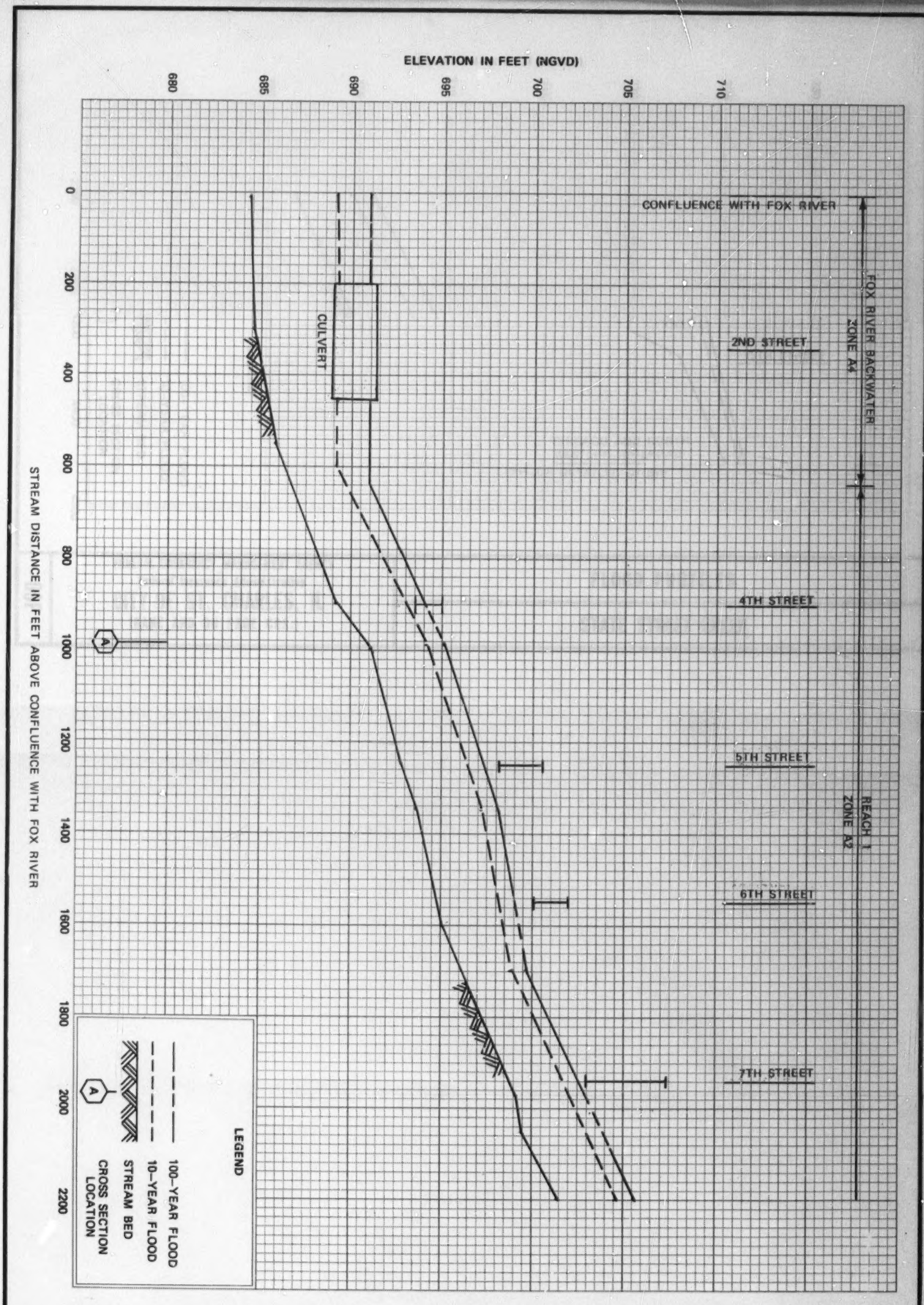
FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

CITY OF ST. CHARLES, IL
(KANE AND DU PAGE COS.)

FLOOD PROFILES

7TH AVENUE CREEK TRIBUTARY



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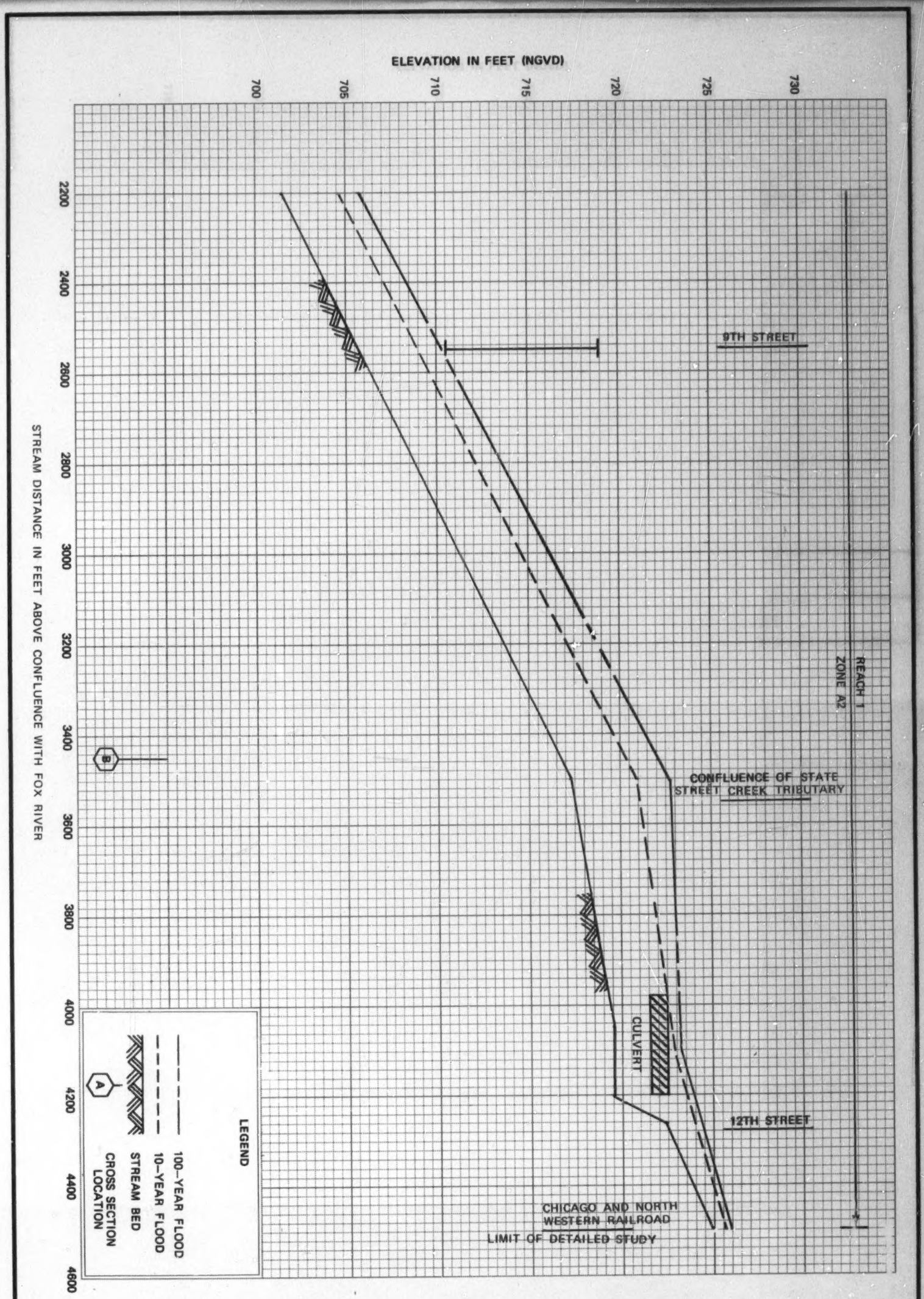
FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

CITY OF ST. CHARLES, IL
(KANE AND DU PAGE COS.)

FLOOD PROFILES

STATE STREET CREEK



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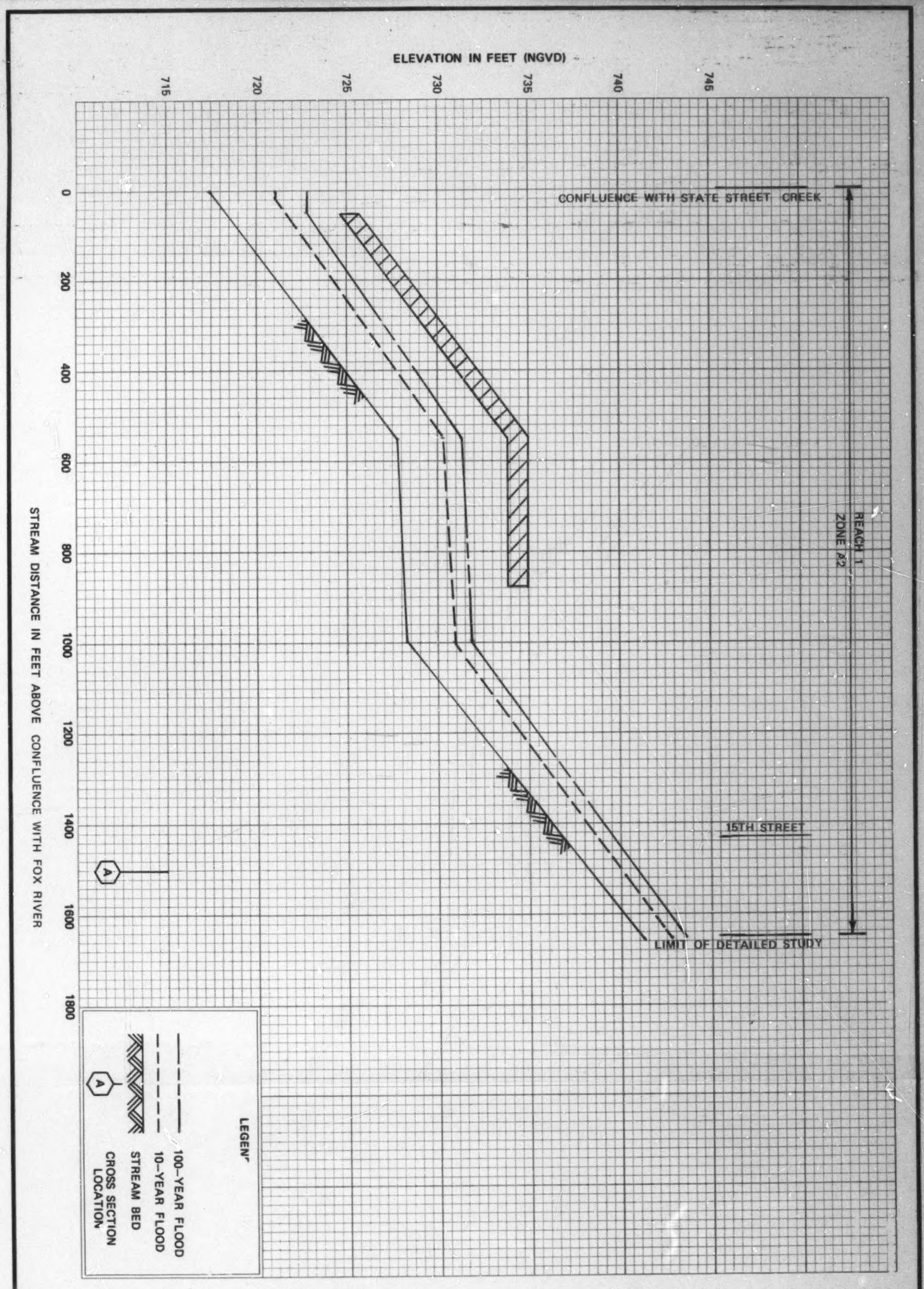
FLOOD PROFILES

STATE STREET CREEK



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FLOOD PROFILES

STATE STREET CREEK TRIBUTARY